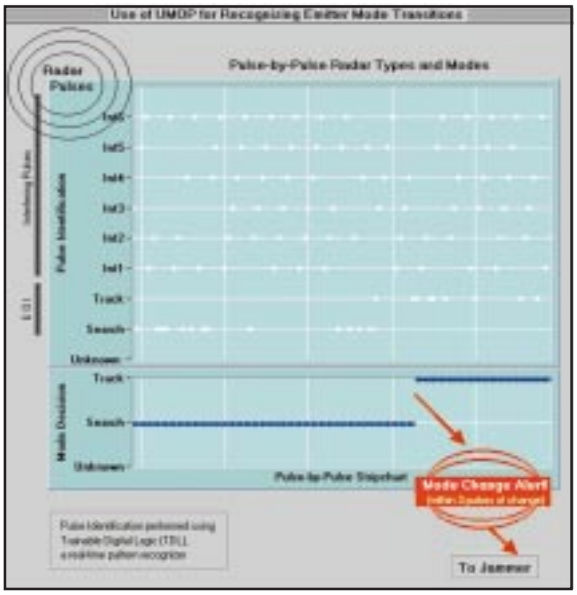
ECM Advancements Enhance Pilot Survivability



Payoff

By using innovative pattern recognition technology, surgically implanted defibrillators will decrease heart attacks, hard disk drive manufacturers can produce more efficient disks with more storage and less errors, and products coming off assembly lines can be more consistent. This same system will allow pilots to fly safer missions into hostile territory by picking up hostile radar signals, identifying the radar family, and then countering them before they can launch a weapon, with minimal additional hardware and cost being added to the aircraft.

Accomplishment

The Air Force Research Laboratory's (AFRL's) Sensors Directorate (SN) developed a hardware-based enhancement to current electronic countermeasures (ECM) systems, using Phase II funding from the Small Business Innovation Research (SBIR) program, to identify specific radar signals. The same technique can be transferred to the medical, data storage, and manufacturing fields. Engineers from Advent Systems, Inc., Mountain View, CA, used a novel pattern recognition method, called Trainable Digital Logic (TDL), to develop hardware that can detect precursors to heart fibrillation, detect computer disk drive errors while increasing data density, and track products on assembly lines, making their manufacturing more consistent and efficient.

Background

There are huge amounts of electromagnetic signals being broadcast in the aerial battle space. For pilots to survive in this hostile environment, it is extremely important for aircraft ECM systems to identify and counter hostile signals as soon as possible. Sensors Directorate scientists recognized that if an ECM system could identify particular radar pulses (thus discriminating between search) and then begin countering them in real-time (before entering track mode), they could greatly enhance the pilot's survivability. While researching this problem, the Sensor Division discovered a technology patented in 1972 by Advent Systems, Inc., which involved the application of their pattern recognition method known as TDL. The TDL technology uses 48-bit patterns and eight possible sources to perform 113,000 pattern classifications per second for real-time classification and identification of radar pulses. The TDL system's output is a digital word advising the countermeasure system of a threatening mode change in a designated-radar. By using the receiver of the ECM pod, this TDL-based system enhances its effectiveness to counter hostile threat. Implementing the hardware on an application specific integrated circuit (ASIC), increases the system's speed and output. Another major accomplishment for this technology is its transition into several manufacturing applications, such as surgically implanted defibrillators monitoring a patient's ECG pattern and more efficient computer hard disk drives. Additionally, it has the potential to inspect and compare assembly line products.